A SHORT 2,

DISSERTATION

ON THE

Jamaica Bath Waters:

To which is prefixed,

AN

INTRODUCTION

CONCERNING

Mineral Waters in general;

Shewing the Methods of examining them, and aſcertaining their Contents.

BY THOMAS DANCER, *M. D.*

PHYSICIAN TO THE BATH. 4

KINGSTON, (JAMAICA)

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◆

PREFACE.

THE virtues of the Bath Waters have been eſtabliſhed by the experience of almoſt a century, yet very little has been done to aſcertain their particular nature. The account given by Dr. *Brown* in his hiſtory of Jamaica, as well as that in the hiſtory publiſhed in 1774 (which are the only ones that I have ever ſeen) are both not only defective, but extremely erroneous. What may have been done by my predeceſſors, or others, in the inveſtigation of theſe waters I am totally unacquainted with, as their experiments have never come to light:

I hope therefore that my humble attempts may not be unacceptable to the public.

Although the chemical analyſis of mineral waters may not be adequate to a full explanation of their virtues and effects, yet it certainly tends to throw conſiderable light on their operation, and to direct to a more ſafe, certain, and beneficial application of them. It is even uſeful to know what a mineral water does *not* contain, as will be ſeen from the miſtaken notions that have been entertained concerning the waters here treated of.

To make the ſubject univerſally intelligible, I have, in an introductory part, given a few chemical ſketches relating to it; in which I can pretend to no novelty or merit, unleſs from the mode of arrangement, and from having avoided, as much as poſſible, technical obſcurity.

I might have enlarged much more than I have done upon the uſes of the Bath waters, but it would have been impoſſible to particulariſe diſeaſes and ſymptoms with ſo much nicety, as to preclude the neceſſity of advice, or make a book ſerve the place of a phyſician; but I preſume I have ſaid enough to ſhew their extenſive utility, and to explain in ſome degree their nature and operation. Could I have told how to make the publication more uſeful, and more deſerving of the liberal patronage it has met with, no pains ſhould have been wanting; but having done my beſt, I have only to add my grateful acknowledgments, and to pray that the moſt favourable conſtruction may be put on my endeavours.

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INTRODUCTION;

CONTAINING

A ſhort Eſſay on Mineral Waters.

SECTION I.

MINERAL WATERS conſtituting a very uſeful branch of the Materia Medica, have from the earlieſt ages engaged the attention of mankind: As they are various in their nature they afford a remedy for various diſorders, but are particularly beneficial in complaints of the chronical kind, where all other medicines frequently fail. The improvements which have been lately made in chemiſtry have enabled phyſicians ſo fully to explore and aſcertain the nature of many of the mineral waters, as to imitate them with great exactitude; and, as ſome of them owe their efficacy to a volatile principle that ſuddenly eſcapes notwithſtanding every means that can be made uſe of to detain it, the * artificial impregnations of waters may in a few inſtances be preferable to thoſe formed by nature; that is, when they cannot be uſed on the ſpot, or where they cannot be obtained in a perfect ſtate, *viz.* without having previouſly ſuffered ſome change, if not loſs of their properties: But, in general, nature prepares this claſs of remedies much more perfectly in her laboratory than the chemiſt can do in his; for though we may by analyſis detect the ſeveral principles of a mineral water, yet we cannot always again combine thoſe principles in the mode they before exiſted, and ſo as to give them the ſame properties. Mineral waters will therefore ever retain their importance; and as they are, in ſome diſeaſes of the human body, the moſt efficacious kind of remedy, ſo they are at the ſame time the moſt agreeable one, and can with leſs inconveniency or diſguſt be perſiſted in, for a due length of time, than any other whatſoever.

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* Should any of my readers be deſirous of being inſtructed in the method of preparing the mineral waters artificially, I muſt beg leave to refer them to Dr. *Prieſtly*, or to a late pamphlet by Dr. *Elliot*, in which is explained the particular manner of imitating almoſt all the moſt uſeful mineral waters, whether ſaline, chalybeate, or ſulphureous.——The apparatus for this purpoſe, as invented by Dr. *Prieſtly*, and improved by Dr. *Nooth* and others, may be bought of the different druggiſts in this iſland.

Among the great number of mineral waters found in different parts of the world, I may with great ſafety aſſert, that there cannot be a more valuable one than that which is the ſubject of this publication, or that poſſeſſes greater virtues in the cure of ſundry diſeaſes; to make the nature and effects of which better underſtood, it will be neceſſary to premiſe ſomething concerning *mineral waters in general*, and of the methods made uſe of in examining them: I hope to explain the ſubject ſo as to render it intelligible to thoſe who have never before ſtudied it, and have no previous acquaintance with chemiſtry; in order to which, we muſt take a ſlight * ſurvey of chemical bodies, and of their ſeveral affinities or relations to each other.

A General View of Chemical Bodies.

ALL the bodies in nature, conſidered in relation to their chemical properties, are diviſible into ſix claſſes, *viz.*—1. Salts, —2. Inflammable Subſtances,—3. Earths and earthy Subſtances,—4. Metals and metallic Subſtances,—5. Water,—6. Air and aerial Subſtances.

I. SALTS.

THESE are defined by Chemiſts *to be fuſible with heat, ſapid in the mouth, and ſoluble in water*; but the two laſt mentioned properties, conſtitute their moſt general character. It is not neceſſary in ſuch a ſketch as this to ſtudy much preciſion; I hope therefore the chemiſts will not complain of my definitions being inaccurate and incomplete.

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* The ſcience of chemiſtry has ſuch an extenſive connection with the arts, and with the other branches of natural knowledge, that I flatter myſelf the following outlines may be uſeful not merely in relation to mineral waters, but to many other ſubjects that require inveſtigation—as, the proceſs of ſugar boiling, diſtillation of rum, manufacture of indigo, manufacture of pot-aſh, &c. &c. all which depend directly on chemiſtry, and certainly require ſome ſhare of chemical knowledge.

The following table exhibits a general view of ſalts, and requires only a ſimple inſpection to be perfectly underſtood.

TABLE OF SALTS.

I. SIMPLE.

1. Acid.	*Foſſile.*	Vitriolic,	*viz.*	*Oil of Vitriol*
		Nitrous,	—	*Aqua Fortis*
		Muriatic,	—	*Spirit of Salt*
	Vegetable.	Acetous,	*viz.*	*Vinegar*
		Tartarous,	—	*Tartar*
2. Alkali.	*Fixed.*	Vegetable,	*viz.*	*Pearl Aſhes*
		mild		*or Salt of Tartar*
		cauſtic		
		Foſſile,	—	*Barilla*
	Volatile.	Volatile,	*viz.*	*Sp. of Hartſhorn*
		mild		*or Sal. Volatile*
		cauſtic		

II. COMPOUND.

1. Neutral, compoſed of *Acid* and *Alkali*.
2. Earthy, compoſed of *Acids* and *Earths*.
3. Metallic, compoſed of *Acids* and *Metals*.

The above view of the ſimple ſalts, I think, can require no ſort of explanation; it is obvious from the arrangement, that they are generically diſtinguiſhed by being either acid or alkaline; the acid ſalts are either *foſſile*, or *vegetable*: Again, the foſſile acids are of three kinds, *vitriolic*, *nitrous*, and *muriatic*; the common names of which are ſubjoined. The vitriolic acid is the ſame thing as *oil of vitriol*; the nitrous acid is *aqua fortis*, or *ſpirits of nitre*; and the muriatic acid is *ſpirit of ſalt*. In the ſame manner the alkaline ſalts are divided and ſubdivided. By arranging ſubſtances in this method, the memory is much aſſiſted, and deſcriptions rendered unneceſſary. I ſhall proceed to enumerate the other compound ſalts in the ſame manner.

I. NEUTRAL SALTS

ARE thoſe which are formed by the union of an acid and alkali; having the properties of neither, but making (as chemiſts ſpeak) a *tertium quid*; that is, a new ſubſtance *ſui generis*, or of a diſtinct kind.

The following table exhibits a catalogue of moſt of the neutral ſalts, and ſhews the manner in which they are formed. It is to be thus underſtood; *viz.* the *vitriolic* acid in the firſt column, combined with the *vegetable* alkali in the ſecond, makes the neutral ſalt, in the third column, called *vitriolated tartar:*—Again, the *vitriolic* acid, with the *foſſile alkali* in the next line, forms *Glauber's ſalt*, &c. &c.

TABLE OF NEUTRAL SALTS.

ACID.	ALKALI.	NEUTRAL SALTS.
1. *Vitriolic.*	Vegetable,	*Vitriolated Tartar*
	Foſſile,	*Glauber's Salts*
	Volatile,	*Vitriolic Ammoniac*
2. *Nitrous.*	Vegetable,	*Nitre, or Salt-petre*
	Foſſile,	*Cubic Nitre*
	Volatile,	*Nitrous Ammoniac*
3. *Muriatic.*	Vegetable,	*Digeſtive Salt*
	Foſſile,	*Common Salt*
	Volatile,	*Crude Ammoniac*
4. *Vegetable.*	Vegetable,	*Diuretic Salt*
	Foſſile,	*Rochelle, or Seignette do.*
	Volatile,	*Spirits of Mindererus*

Table of ſuch Earthy and Metallic ſalts as are found in Mineral Waters:

I. WITH THE VITRIOLIC ACID, AND

1. *Earths.*	Calcareous earth,	*Selenites, or Gypſum*
	Magneſia,	*Epſom Salts, or bitter purging do.*
	Clay or particular earth, -	*Allum*
2. *Metals.*	Zinc, -	*White Vitriol*
	Iron, -	*Green Vitriol*
	Copper, -	*Blue Vitriol*

II. WITH THE NITROUS ACID, AND

Calcareous earth, - Calcareous nitre. *(doubtful)*

III. WITH THE MURIATIC ACID, AND

Calcareous earth,	Fixed ammoniac.
Magneſia,	

I have judged it needleſs in this place to enumerate any of the metallic ſalts, except ſuch as are found in waters, and of which it was proper to know the compoſition. The next general claſs, is that of

II. INFLAMMABLE SUBSTANCES.

THESE are ſuch bodies as (without any definition) are known to take flame and conſume with heat. Under this head are included all oils, reſins, ſulphur, ardent ſpirits, &c.

The inflammability of bodies depends on a principle they contain called by chemiſts phlogiſton; which principle exiſts in all bodies, but in different quantities and in different ſtates of combination; whence their difference in reſpect of inflammability and various other properties. So many phenomena in nature depend on this pervading principle, that the ſtudy of it conſtitutes a main branch of chemical philoſophy. We ſhall ſee hereafter what connection it has with the ſubject of mineral waters, but at preſent we need take no further notice of it.

III. METALLIC BODIES.

THE well known properties of theſe are their great ſpecific gravity and fuſibility with certain degrees of heat. All the metals contain a great portion of phlogiſton; deprived of which they loſe their metallic form, and are reduced to a ſort of earth called calx,—thus *e. g.* ceruſſe is the calx of lead.

The metals, in their foſſile ſtate, are found in various forms :

1. Virgin or pure.
2. In ores combined with earths.
3. Mineralized with ſulphur and arſenic
4. Diſſolved by acids or by other means, and mixed with mineral waters.

TABLE OF EARTHS.

I. ABSORBENTS.

The character of theſe is their efferveſcence with acids : they are of two kinds :

1. Calcareous, *viz.* chalk, &c. which convert by heat into quick-lime, and become cauſtic. This is effected by the expulſion of fixed air; which as ſoon as they imbibe again they loſe their cauſticity and become mild.

2. Magneſia, which does not convert into quick-lime, or become cauſtic as the preceding.

II. CHRYSTALLINE OR FLINTY.

Theſe are hard and ſtrike fire with ſteel: are either

1. Apyrous, *i. e.* indeſtructible by heat as ſome of the precious ſtones, or
2. Vitreſcent or fuſible, running by heat into glaſs; ſuch are common flints, ſand, &c.

III. ARGILLACEOUS,

Or Clays, which do not efferveſce with acids, nor melt into glaſs, but are unchangeable in the fire.

IV. MICACEOUS.

Stones of a ſhining laminated or fibrous texture. They do not efferveſce with acids, nor ſtrike fire with ſteel, but are either

1. Talcky, which in a ſtrong heat are vitreſcent, or
2. Aſbeſtos, Amianthos, &c. indeſtructible by heat.

N. B. Gypſum and gypſeous matters, which are ſometimes conſidered under the head of earths, are more properly earthy ſalts. *(Vid. table of earthy ſalts.)*

Spars are ſtones of very different natures, and arrange under abſorbent earths, micaceous earths, &c.

Marles are abſorbent earths.

V. WATER.

THE properties of water are too well known to require any deſcription. Pure elementary water is hardly to be obtained, but it may be conſidered either as ſuch, or elſe impregnated with foreign matters, as, particularly, in mineral waters.

VI. AERIAL MATTERS.

AIR, as well as water, has by all philoſophers been conſidered as an elementary ſubſtance; but this ſeems to be brought into ſome doubt by the late celebrated experimenters in chemiſtry, who have diſcovered many *ſpecies* of air, and diſtinguiſh that by which animal life is ſupported, as *atmoſphe-*

ric or reſpirable air: The other kinds more particularly deſerving of note are,

1. Fixed or mephitic air †.
2. Phlogiſticated air, which is either
    1. Inflammable, taking fire, or
    2. Non-inflammable, extinguiſhing flame.

Theſe kinds of air are variouſly produced, and exhibit wonderful phenomena; but this is not a place to enter into any further conſideration of that curious ſubject. *

Having now pointed out the general and diſtinguiſhing characters of the ſeveral claſſes of chemical bodies, I ſhall proceed to explain the *affinities* of theſe, or the relations which they have to each other; upon which depend all the proceſſes in chemiſtry, as well as many of the moſt important operations in nature.

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† Mephitic Air is demonſtrated to be an Acid.
(Vid. Bewley apud Priestly.)

* Vid. Priestly and others.

On Chemical Affinities.

THE affinities of bodies ſignify their diſpoſition to unite, or the attraction they have for each other, which is owing to ſome unknown relation between them: this attraction is greater between ſome than others, and is therefore called *elective*: — For example, acids have an attraction both for *alkalies* and abſorbent earths, but a much ſtronger attraction for the former than the latter; in conſequence of which, if an abſorbent earth be firſt diſſolved in an acid, and afterwards an alkali be added, the acid having a greater affinity to the latter will unite with it and depoſit the earth. Again, acids in general have a greater attraction for earths than for metals, ſo that if you add an earth to the ſolution of a metal in any acid, the metal will be precipitated, It is in this way that various combinations and decompoſitions are effected, and that we are enabled to analyze bodies and detect their principles. I need not here give any further illuſtration of the ſubject, as the application of it to the inveſtigation of mineral waters, which this is intended to explain, will exhibit a perfect view of it. All that is further required in this place, is, to point out the known laws of affinities, as they have been diſcovered in the courſe of experiment and in the practice of chemiſtry: theſe have been reduced into tables: the following one is the moſt approved, as being corrected by ſome of the greateſt philoſophers of the age.

The table is thus to be underſtood, *viz.* Under the head of acids is placed, firſt, phlogiſton, then alkali mild, &c. the meaning of which is, that acids have an attraction for thoſe different ſubſtances according to the order in which they are placed, *i. e.* they have a greater attraction for phlogiſton than alkalies, for alkalies than abſorbents, earths, &c.

Table of Affinities or Elective Attractions.

I. ACIDS IN GENERAL.

1. Phlogiſton
2. Fixed alkali, *cauſtic mild*
3. Quick-lime, or *cauſtic calcareous earth*
4. Magneſia

5. Calcareous earth *mild*
6. Volatile alkali *cauſtic*
7. Metallic ſubſtances *in general*
8. Volatile alkali *mild*
9. Earth of alum
10. Pure or precious metals.

2. VITRIOLIC ACID.

Vid. acids in general.
1. Zinc
2. Nickell
3. Cobalt
4. Iron
5. Copper
6. Silver
7. Tin
8. Lead and Mercury
9. Volatile Alkali
10. Earth of Alum.

3. NITROUS ACID.

Vid. acids in gen.
1. Zinc
2. Lead or Tin
3. Iron
4. Biſmuth and Antimony
5. Copper
6. Arſenic
7. Mercury
8. Silver
9. Platina.

4. MURIATIC ACID.

Vid. acids in gen.
1. Zinc
2. Iron
3. Tin
4. Regulus of Antim.
5. Copper
6. Lead
7. Silver
8. Mercury
9. Gold.

5. VEGETABLE ACID.

1. Iron
2. Copper.

6. MEPHITIC AIR, or MEPHITIC ACID.

Metallic ſubſtances
Cauſtic calcar. earth or quick-lime
Fixed alkali
Earth of Magneſia
Volatile Alkali

7. ALKALIES IN GENERAL.

Vitriolic acid
Nitrous acid
Muriatic acid
Vegetable acid
Oils. Phlogiſton, or Sulphur

8. CALCAREOUS EARTHS.

Vitriolic acid
Nitrous acid
Muriatic acid
Sulphur

9. PHLOGISTON.

Nitrous acid
Vitriolic acid
Muriatic acid
Metallic bodies
Alkalies

10. SULPHUR.

Fixed alkali
Quick-lime
Iron
Copper
Lead
Tin
Silver
Antimony
Mercury
Arſenic
Volatile alkali

11. METALLIC SUBSTANCES in general.

Muriatic acid
Vitriolic acid
Nitrous acid
Phlogiſton
Fixed air

12. GOLD,——Aqua regia

13. SILVER.

Muriatic acid
Vitriolic acid
Nitrous acid
Lead, Copper

14. MERCURY.

Muriatic acid
Vitriolic acid
Nitrous acid
Gold
Silver
Lead, &c.

15. IRON.

Vitriolic acid
Muriatic acid
Nitrous acid
Regulus of antimony

16. COPPER.

Vitriolic acid
Muriatic acid
Nitrous acid
Vegetable acid

I flatter myſelf that the preceding ſketches are ſufficiently intelligible to every reader who may think it worth his pains to give the ſlighteſt attention to them; and that they will ſerve to render what follows on Mineral Waters eaſily comprehended.

CHAPTER II.

On the CONTENTS *of* MINERAL WATERS.

AS this is not a work intended for the peruſal of the learned, I do not think it requiſite to enter largely into the inveſtigation of the ſubject, but ſhall content myſelf, according to the plan I ſet off with, in giving a plain and eaſy introduction to it. Such of my readers as may be induced to ſtudy it more fully, and to extend their reſearches into this pleaſing and uſeful ſcience, muſt have recourſe to other authors; amongſt whom I would particularly recommend Dr. *Faulkener*, one that in this part of my work I am particularly indebted to.

The liſt of matters contained in mineral waters was formerly much larger than at preſent, later experience having demonſtrated the impoſſibility of many impregnations ſuppoſed by the old chemiſts, particularly the nitrous and ammoniacal ſalts, of which we find ſo frequent mention in former writers: The acids of theſe ſalts have never (like the vitriolic) been found ſeparate, and if they were [illegible], they would ſtill want a proper baſe, as neither the vegetable or volatile alkali have ever been diſcovered in a foſſile ſtate.

TABLE exhibiting the ſeveral CONTENTS of MINERAL WATERS.

I. *SALTS.*

1. Acid, - *Vitriolic in a ſeparate ſtate.*
2. Alkali, - *Foſſile Alkali.*
3. Neutral, - *Glauber's Salt, Common do.*

II. *INFLAMMABLES.*

1. FOSSILE OIL, *viz.* PETROLEUM.

1. Separate, or floating on the ſurface of waters.
2. Combined with an *Alkali* in form of a *Soap*.

2. SULPHUR.

1. *Per ſe*, diffuſed or ſuſpended.
2. Combined with *Alkali*, forming *Hepar Sulphuris*.
3. Combined with Calcareous Earth in a cauſtic ſtate, forming *Calcareous Hepar Sulphuris*.

III. *EARTHS and EARTHY SALTS.*

1. CALCAREOUS EARTH.

1. In a *cauſtic* ſtate, or deprived of fixed Air.
2. Combined with

the Vitriolic Acid, forming Selenites.

3. Combined with Sulphur, forming Hepar Sulphuris.

2. EARTH OF MAGNESIA *diſſolved.*

1. By Vitriolic Acid, forming *Epſom Salts.*
2. By Muriatic Acid, conſtituting a *Salt* that has no name.

3. EARTH OF ALLUM.

Forming with Vitriolic Acid the Salt of Alum

IV. METALLIC MATTERS.

1. COPPER *diſſolved.*

By the Vitriolic Acid in the form of Blue Vitriol.

2. IRON *diſſolved.*

1. By Fixed Air.
2. Vitriolic Acid in form of *Green Vit.*
3. *Hepar Sulphuris.*

3. ZINC *diſſolved.*

Vitriolic Acid, in form of *White Vitriol.*

V. AERIAL MATTERS.

1. Common, or *atmoſpheric* Air,
2. Mephitic, or *fixed* Air.
3. Phlogiſticated, or *inflammable* Air.

The above table comprehends, on the authority of the beſt Chemiſts, all the known impregnations of mineral waters. Many other matters, as I have ſaid, were formerly included; but I ſuggeſted the reaſon why in particular the nitrous and ammoniacal ſalts cannot have an exiſtence in mineral waters. For ſimilar reaſons none of the metals, except Iron, Copper, and Zinc, are ever found in waters, *viz.* becauſe there are no foſſile menſtrua capable of diſſolving them, the vitriolic acid and hepar ſulphuris not acting on the other metals except by the aſſiſtance of heat, or under ſome other circumſtances that are not ſuppoſed to take place in the bowels of the earth.

Arſenic has however, in particular, been conjectured to be preſent in ſome waters; but in the opinion of the beſt authors, this poiſonous ſemi-metal is only ſoluble in water when deprived of its phlogiſton or ſulphur, in which ſtate it cannot be found in ores.

The exiſtence of an * actual Sulphur in waters has been long queſtioned, but it ſeems on very good evidence, as we ſhall ſee when we come to the manner of analyſing waters, to be really found in ſome few of them. The aerial impregnations of waters are of late diſcovery, and have thrown an entire new light upon the ſubject, as they account for ſeveral combinations among the fixed matters, as well as for the medicinal efficacy of many of the waters of principal note.

I ſhall here ſubjoin a catalogue of the moſt important mineral ſprings in the various parts of the globe, with a ſummary of their contents, according to the lateſt and moſt approved analyſis; which may ſerve not only to gratify curioſity, but to convey a general idea of their medicinal qualities and uſes in the cure of diſeaſes.

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* Some chemiſts have ſuppoſed the Sulphur found in mineral waters did not exiſt in the waters as a ſulphur, but is formed afterwards by a new union of the component principles.

CATALOGUE OF THE MOST CELEBRATED MINERAL WATERS.

Aix-la-Chapelle.—Thoſe Waters contain an actual Sulphur, and are very hot.

Bath (Engliſh) Waters.—Contain fixed Air, phlogiſticated Air, Hepar Sulphuris with Quick-lime, and a little Iron —
Vid. Faulkener, Nooth, Prieſtly.

Bath (Jamaica) *Vid. Analyſis following.*

Barcges.— Hepar Sulphuris, Bitumen, and Sea Salt.

Buxton.—Similar to *Briſtol.*

Briſtol.—Calcareous Earth, marine Salt, and ſome Sulphur. *Vid. Elliott.*

Caroline Baths (in Germany).—Pure alkaline Salt, calcareous Earth, and a little Iron.
Vid. Hoffman.

Cheltenham. — Epſom, or bitter purging Salts. *Vid. Lewis.*

Hartfell.—Martial or green Vitriol in conſiderable quantity. *Lewis.*

Iſlington.—A Chalybeate Water.

Moffat (in Scotland).— Sulphur and marine Salt. *Plummer.*

Moffat (in Jamaica).—The ſame as the above.

Vid. Analyſis by Dr. Mitchell.

Pyrmont.—A great deal of fixed Air, by which Iron is diſſolved in it. *Brownrigg.*

Spa.—Fixed Air, Ocher, Sulphur.

Sedlitz (in Bohemia).—Epſom or purging Salts.

Teplitz (in Germany).—Is a Spring of pure hot Water. *Hoffman.*

Tilbury.—Alkaline Salt. *Lewis.*

Wicklow (in Ireland).—Copper, or blue Vitriol.

Smith's (in Jamaica).—A martial Vitriol, like the *Hartfell Spa.* Dr. Clarke found that it is alſo impregnated with fixed Air, and ſuſpects the Iron to be kept diſſolved by this as well as the Acid.

Comparative View of the Temperature of the ſeveral Hot Springs in different Parts of the World.

		Farenheit.
Aix la Chapelle,		
	Bain de l'Empereur,	127
	Bain des Pauvres,	112
Briſtol Hot-well	- -	76
Buxton,	- - - -	59
Mallow,	- - -	63
Bath (in England.)	Croſs Bath -	112
	King's do. -	116
	Hot do. -	116
	Hot Spring -	116
Bareges, higheſt,	- -	112
—— (*Jamaica*)	- -	126
Dax (in Guienne), ſaid to be	-	140

Japan Hot Waters, ſaid to be near the boiling point.

* *Muſq. Sh.* Waters, near the boiling point.

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* I am informed by my friend *Major Lawrie*, Superintendent of the Muſquito-ſhore, (a Gentleman well known for his active ſervices in the defence of that valuable country, where he reſided many years, and employed a very attentive obſervation on every uſeful and curious object,) that ſo great is the heat of this ſpring that either animal or vegetable ſubſtances, placed in the reſervoir into which it runs, are in a moderate ſpace of time rendered fit for uſe, and that the Indians accordingly frequently dreſs their food in it. It appears nevertheleſs to contain no mineral impregnation.

Of the Method of Analyſing Mineral Waters.

IT has been before remarked, that there is no water to be obtained perfectly pure. That which is moſt free from impurities is ſnow water, next rain water[*], and then the waters of limpid rivers; but they all contain more or leſs of earthy and ſaline matter, even after repeated diſtillations, which has favoured the hypotheſis of the ancient philoſopher, that earth and all things were formed of water.

The firſt thing to be attended to in the examination of any water is not its pellucidity, or apparent purity, but its weight, the pureſt water being always the lighteſt. The gravity of water is aſcertained either by weighing a certain meaſure of it in a well adjuſted pair of ſcales, or by the water poiſe called the hydrometer. Where proper ſcales

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[†] **A ſuſpicion has been entertained, that the rain water of this country contained vitriolic acid; to determine this I collected ſome in a glaſs veſſel during a heavy ſhower, which I tried with the ſolutions of ſilver, lead, and mercury in the nitrous acid;— With the firſt, there appeared a light purple tinge, which at length became reddiſh; with the lead it dropped a white precipitate, and the ſame with mercury, which I allowed to remain for 24 hours, without obſerving any change to yellow, as ſhould have happened had there been any vitriolic acid preſent.—*Vid. page* 16.)**

and weights, or the above inſtrument cannot be procured, another method has been propoſed for comparing the relative weight of the water of any mineral ſpring with the other waters in the neighbourhood, *viz.* by tincturing the water with ſaffron, or any other colouring matter that makes but little addition to its own weight, and then inſerting the bottle filled with it in a veſſel of the water you want to compare it with. If the coloured water is ſpecifically heavier than the common water, it will of courſe run out and communicate a tincture to the water in which the bottle is immerſed.

Table of the Weights of different Waters.

		Oz.	Dr.	Gr.
Of diſtilled water,	1 pint weighs	15	1	50
Rain water,	ditto	15	2	40
Spring water,	ditto	15	3	129
Sea water,	ditto	15	5	20

After having aſcertained the apparent and ſenſible qualities of any water with its relative weight to other water, or to pure water, we may proceed to try it by ſome of the moſt ordinary and general methods, as follow:

1. If it lathers well with Soap.
2. If it curdles milk.
3. If it efferveſces on the addition of acid or alkali.
4. If it changes the colours of blue flowers, infuſed in it for ſome time, either to red or green.
5. If it turns milky on adding to it a few drops of any of the following ſolutions, *viz*.
    1. A ſolution of hepar ſulphuris *(i. e. liver of ſulphur,)* in water.
    2. A ſolution of ſaccharum ſaturni, *(i. e. ſugar of lead,)* in diſtilled water.
    3. A ſolution of lead in aqua fortis.
    4. A ſolution of ſilver in ditto.

Or, laſtly, if it ſtrikes a black or purple colour with the powder or tincture of Galls.

By theſe general trials we can diſcover not only the degree of purity in a water, but if it contains any mineral impregnation we can form ſome probable conjecture as to the nature thereof, to direct us in our further reſearches. The explanation of the above modes of trial will be ſeen preſently as we go on to point out more particularly how the various ſubſtances contained in mineral waters may be ſeverally detected.

I. To diſcover the Aerial Impregnations of Waters.

1. FIXED AIR,—firſt, gives to waters a ſparkling appearance and poignant taſte, ſimilar to Champaigne or Perry, which liquors, as well as many others, contain a conſiderable quantity of it *.

Secondly, Waters containing fixed air added to lime water precipitates the calcareous earth which was only rendered ſoluble in water by being deprived of its fixed air.

Thirdly, Waters containing fixed air have the ſingular property of diſſolving iron.

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* Waters containing fixed air are difficultly kept, the bottles burſting; Mr. SHACKLEFORD lately returned from the continent of North America, informs me, that, at the famed plains of Saratoga, he ſaw, in company with his fellow traveller Dr. JAMES, (a gentleman well known for his medical abilities) a mineral water that contained ſo much elaſtic air, that bottles only about half filled were broke by it.

II. INFLAMMABLE AIR in waters, as alſo fixed air, may be collected, by tying an oiled bladder over the neck of a bottle containing the water. Inflammable air is lighter than common air, has a peculiar ſmell, and takes flame * when it approaches any burning body.

A more accurate method of trial may be ſeen in the works of that learned philoſopher Dr. *Prieſtly*, to whom I muſt refer my readers for more ample inſtruction reſpecting this and the ſeveral other ſpecies of phlogiſticated air.

To diſcover an acid in Waters.

THE only acid found in waters in a ſeparate ſtate *(vid. table,)* is the vitriolic, and moſt commonly that ſpecies of it called the *volatile ſulphureous*, from the ſmell, &c. which it has from the phlogiſton with which it is combined.

In whatever form the vitriolic acid enters into waters, it may be detected in the following manner:

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* The damps of mines are either fixed or inflammable air.

1. By the infuſion of blue flowers in the water, which, if there be an acid, will become *red* *.

This laſt, though a common one, is by itſelf not deciſive, becauſe fixed air and alum in waters will effect the ſame change.

2. By adding to the water a little alkaline ſalt, or a few drops of oil of Tartar.

If the acid be preſent in any quantity, it will excite an efferveſcence with the alkali.

3. By dropping into the water a tincture of ſoap in ardent ſpirits, provided the water contains an acid it will unite immediately with the alkali of the ſoap, and the oil, which is the other ingredient in the compoſition of ſoap, is ſeparated and renders the water milky: This ſerves to explain the effect of hard waters in general in curdling ſoap.

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* Alkalies turn blue vegetables of a *green* colour, (*vid. p.* 17.)

4. By dropping into the water, a ſolution of hepar ſulphuris, which is a combination of ſulphur and alkali: The ſame attraction, where there is an acid, takes place here as above in No. 3; the acid unites with the alkali, and the ſulphur precipitated makes the water turbid and milky.

I obſerved that an aluminous impregnation gives to waters tried in the above manner moſt of the ſame appearances as the vitriolic acid in a ſeparate ſtate; but to diſtinguiſh aluminous water from thoſe containing an acid, we may,

1. Repeat the above experiment on the waters after they have ſtood for ſome time; if the changes produced were cauſed by an alum in them, the ſame reſult will follow on making the ſame trials; but the acid of waters being, as was before ſaid, generally the volatile vitriolic, this upon the water ſtanding for ſome time flies off.

2. Waters containing an acid will effervеſce with and diſſolve magneſia, remaining

perfectly clear, (provided only the neceſſary quantity of magneſia is made uſe of,) but when they contain an alum, the addition of magneſia will cauſe a precipitation, the vitriolic acid having a greater attraction for that than the aluminous earth.

There remains one more teſt, which ſerves to diſcover the vitriolic acid either in a ſeparate or combined ſtate; this is an *unſaturated* * ſolution of lead in the *nitrous* acid, which being added to any water that contains the vitriolic acid, this acid *(viz. the vitriolic)* having a greater attraction for lead than the nitrous, *(vid. table of affinities,)* unites with the lead in place of the latter, and the ſubſtance formed by this union, called a *plumbum corneum*, being not ſoluble in water, diſturbs the tranſparency of it. It is requiſite in the above experiment that there ſhould be a redundancy of acid in the teſt, to prevent the lead from being precipitated by any calcareous earth the water may at the ſame time contain.

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* *Unſaturated*, ſignifies, not ſo much as the acid is capable of diſſolving.

To diſcover an Alkali in Waters.

THE alkali found in mineral waters we have ſaid is always the foſſile, the vegetable being generated only on the ſurface of the earth.

An alkali in waters is diſcovered,

1. By their turning the blue flowers to a *green* colour.

2. By their efferveſcing on the addition of an acid.

3. By their precipitating chalk from its ſolution in aqua fortis.

N. B. The aqua fortis ſhould be ſaturated with the chalk, (*i. e.* contain as much as it is capable of diſſolving,) or elſe the part of the acid that remains unſaturated will diſſolve the alkali in the water ſo that it will not precipitate the chalk.

4. By their precipitating an ochre from ſolutions of iron in the vitriolic acid, or from a ſolution of green vitriol in water, the acid of the vitriol having a greater attraction for the alkali than the metal, (*vid. table of affinities.*)

As the preſence of a *volatile* alkali in waters is not admitted, it is needleſs to adduce any of the criteria. I ſhall however, for form's ſake, obſerve, that,

1. A ſolution of corroſive ſublimate in diſtilled water is precipitated by the *volatile* alkali in a *white*, but by the fixed alkali in a *red* or *brown* powder.

2. If a water contains any quantity of volatile alkali, it will acquire, from copper immerſed in it, a fine blue tincture.

To diſcover the Neutral Salts in Mineral Waters.

1. GLAUBER'S SALT.

THIS ſalt is known,

1. By its taſte and the form of its chryſtals, which are hexagonal: theſe may be eaſily obtained from waters containing it by a ſlow evaporation till a pellicle forms on the ſurface, and then placing the liquor at reſt for the chryſtals to ſhoot: the addition of a little ſpirit of wine towards the end aſſiſts the chryſtallization.

2. By the ſolution of the ſalt in water coagulating when ſpirit of wine is added to

it; the ſpirits attracting a part of the moiſture from the ſalt, it begins to reſume its chryſtalline form.

3. By its fuſibility in a gentle heat, which is a property peculiar to this neutral ſalt.

4. By no precipitation taking place on adding an alkali to it when diſſolved in water, which always happens to ſalts with an earthy baſe, as Epſom ſalt, &c. (*vid. table of affinities.*)

5. By the precipitation of a yellow powder (*i. e.* a turbith mineral) on adding a ſolution of mercury in the nitrous acid, the mercury leaving the nitrous acid to unite with the vitriolic.

II. COMMON SALT, is known,

1. By the figure of its chryſtals, which are cubes, and which may be obtained by long boiling, and then placing the liquor to cool.

2. By its decrepitation (*crackling*) on being placed on a hot iron.

3. By its decompoſition and ſuffocating fumes, on adding either the vitriolic or the nitrous acid, which have a greater attraction for the alkaline baſe than the muriatic acid, of which it is formed, *(vid. affinities.)*

4. Waters containing ſea ſalt, or the muriatic acid, precipitate lead and ſilver from aqua fortis, the muriatic acid having a greater attraction for thoſe metals than the nitrous.

5. The reſiduum of waters containing ſea ſalt, added to aqua fortis, conſtitute an aqua regia capable of diſſolving gold: It may be tried with gold leaf, or a mark on the touchſtone.

Although the preſence of the other neutral ſalts in mineral waters be ſo very doubtful, I ſhall nevertheleſs point out the characteriſtic properties by which they may be diſtinguiſhed.

1. *Nitre* is known, 1ſt, by the peculiar form of its chryſtals,—2d, by its deflagration or manner of burning,—3d, by its turning the fleſh of animals red.

2. *Calcareous nitre,* or nitre compoſed of an earthy baſe, does not deflagrate as common nitre, but bliſters, and being ſubjected to a ſtrong heat, the acid is expelled and the earth converted into quick-lime.—A ſolution of calcareous nitre is alſo expoſed by the addition of alkali.

3. *Common ammoniac* may be known by its giving out the volatile alkali on adding a fixed one, the acid having a greater affinity for the latter: the volatile alkali is immediately perceived by its pungent vapours when applied to the noſtrils.

To diſcover Sulphur in Waters.

FEW of the waters which, from their ſmell and other properties, have been called ſulphureous, contain a *real* or *actual* ſulphur, but either a hepar ſulphuris, or elſe a ſulphureous Gas, (*i. e.* the phlogiſton) in ſome mode of combination hitherto not very well underſtood.

Waters that contain an actual ſulphur, as it is only ſuſpended, not diſſolved, generally depoſit it about the ſides of the veſſels or reſervoirs in which they are placed; but when preſent only in a ſmall quantity, ſo as not to be perceptible in the foregoing manner, the ſand or mud of the ſprings may be dried and thrown on a plate of hot iron; if there be any ſulphur contained therein the fumes will preſently diſcover it.

Waters containing a *hepar ſulphuris*, or ſulphur united with an alkali, (in which form it is rendered ſoluble in water,) are diſtinguiſhed,

1. By their fœtid ſmell, which reſembles that of the ſcourings of a foul gun.

2. By their tarniſhing the white metals, as ſilver, of a purple or black colour, and gold, of a deep yellow or copper colour.

3. By their lacteſcence on the addition of acids, which by attracting the alkali precipitate the ſulphur.

4. By their turning a ſolution of ſugar of lead of a brown colour, and by their vapours rendering viſible characters wrote with the

above ſolution, which is the common ſympathetic ink. The phlogiſton which theſe vapours contain partly revive the metal in the ſaccharum ſaturni, and thus make the characters viſible.

Sulphur diſſolved in water by means of calcareous earth in a cauſtic ſtate, (or *quick-lime)* exhibits none of the above ſigns of an alkaline hepar ſulphuris. It is detected however, by the addition of alkali, which precipitates the calcareous earth, and by forming a true hepar ſulphuris, the waters then begin to aſſume the qualities enumerated in the preceding paragraph.

To diſcover Foſſile Oil in Waters.

THIS is generally found floating on their ſurface, but may be blended with the water by means of an alkali, or quick-lime, in form of a ſoap.

Such waters will curdle on the addition of acids, juſt the ſame as hard waters do with ſoap.

To diſcover Calcareous Earth in Waters.

THIS is ſoluble in water;

1. By being deprived of fixed air, or in the ſtate of quick-lime, which is very well known from the manner of making lime water; from which the calcareous earth is again precipitated on reſtoring fixed air, as, *e. g.* in breathing into the water through a tube.

There is a quantity of fixed air generated in reſpiration *, and this mode of trial may ſufficiently ſerve; but beſides this there is another method made uſe of—Fixed air produced from the efferveſcence of an acid with an alkali, or with chalk, may be received into a bladder and afterwards made to paſs through the water to be examined in a gentle ſtream: if the water contains a calcareous earth, it will be precipitated, by the fixed air rendering it unſoluble.

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* Dr. *Prieſtly* ſuppoſes that the fixed air produced in reſpiration is not thrown off from the lungs, but is precipitated from the common air by means of the phlogiſton extricated in reſpiration.

The *argillaceous*, *ochrey*, and *flinty* earths can only be ſuſpended or diffuſed, and cannot therefore conſtitute any impregnation in waters.

To diſcover Selenites in Water.

SELENITES, or gypſum, *(vid. table of earthy ſalts,)* which is the matter of all hard waters, is diſcovered,

1. By the well known effect of ſuch waters in curdling ſoap.

2. By the evaporation of theſe waters thin laminous chryſtals, like the ſcales of fiſhes, may be obtained, of a rough aſtringent taſte, which are difficultly ſoluble.

3. By adding a ſolution of mercury in the nitrous acid a turbith mineral is formed, as before explained *(vid. page 7.)*

To diſcover Epſom Salts, and Magneſia, in Waters.

EPSOM SALTS, compoſed of the vitriolic acid and magneſia, *(vid. table,)* are obtained from waters by evaporation and chryſtallization, in the ſame manner as Glauber's ſalts, from which they are eaſily diſtinguiſhed.

1. By the precipitation of magneſia on adding an alkali: Glauber's ſalts having no alkaline baſe ſuffers no decompoſition.

2. By their not being fuſible as Glauber's ſalts.

They are diſtinguiſhed from common ſalt,

1. By giving out no fumes on the addition of oil of vitriol, *(vid. page 7.)*

To diſcover Alum in Waters.

1. ALUM in waters ſhew many of the ſigns of an acid, *(vid. page 16.)*

2. By evaporating waters that contain an alum, they acquire a rough auſtere taſte.

3. An alkali added to an aluminous water, precipitates the earth in *floculi*, or little curdled clouds, (not in a powder) which, if too much alkali be not made uſe of, will be rediſſolved by the ſuperabundant quantity of the vitriolic acid which alum contains,

To diſcover the Metallic Contents of Mineral Waters.

IRON:—The common teſts of the preſence of iron are powdered galls, or tincture of galls in brandy, and the phlogiſticated alkali *. Waters containing iron, with the tincture of galls, ſtrike a purple or black colour: ſometimes the addition of a minute portion of alkali is neceſſary to make this experiment ſucceed. The trial with the phlogiſticated alkali is a much more accurate and pleaſing one; the waters which contain iron ſtrike with this a beautiful Pruſſian blue.

Iron being diſſolved in waters by ſeveral different means, the ſame teſts do not univerſally apply.

I. Waters which contain iron, diſſolved by fixed air, drop it on the eſcape of the air;

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* The *phlogiſticated alkali*, or Pruſſian alkali, as it is called, (becauſe of its uſe in the manufacture of Pruſſian blue,) is made by the calcination of tartar and bullocks blood. The alkali of the tartar is thus charged with a quantity of inflammable matter, and is ſaid to be *phlogiſticated*.——For the explanation of the proceſs by which Pruſſian blue is formed. *Vid. Macquer's Dictionnaire de Chemie.*

hence the difficulty of tranſporting many of the chalybeate waters.

II. Waters containing iron, diſſolved by the volatile ſulphureous acid, likewiſe quickly loſe their properties by ſtanding, but at firſt are to be tried as the following, *viz.*

III. Thoſe that contain a vitriol or iron, diſſolved by the common vitriolic acid.

Martial vitriol in waters is aſcertained,

1. By tincture of galls and phlogiſticated alkali.

2. By alkali or calcareous earth, which precipitate an ochre.

3. By evaporation; ſome waters, as Hartfell, affording chryſtals.

IV. Waters that contain iron, by means of an hepar ſulphuris, are known,

1. By their ſmell.

2. By their not depoſiting any ochre on the addition of alkali.

3. By their not affording chryſtals on evaporation.

V. Waters that contain iron by means of a calcareous hepar ſulphuris;

1. Afford no chryſtals on evaporation.

2. Drop an ochre with cauſtic (though not with mild alkali) it will have no ſmell.

To diſcover Copper in Waters.

1. THE Pruſſian alkali precipitates copper, from waters containing it, in a *red* powder.

2. Volatile alkali, added to waters containing copper, gives them a fine blue or ſapphire colour.

3. An iron wire immerſed in a cupreous water is tranſmuted into copper; the vitriolic acid, which keeps the copper diſſolved in the water, having a greater attraction for the iron, takes that up, and depoſits the copper in its place *.

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* It is ſaid that the waters of *Wicklow* in *Ireland* contain ſo much copper, that they obtain in this way a quantity ſufficient to become an article of ſale.

To diſcover Zinc in Waters.

ZINC is precipitated from waters by the Pruſſian alkali, in the form of a *white* powder.

By proper evaporation chryſtals of white vitriol may be obtained, for it is in the form of a vitriol, or diſſolved by the vitriolic acid, that this ſemi-metal is found in waters.

SECTION II.

I. ON THE BATH WATERS.

THESE hot ſprings, ſituated in the eaſt end of the iſland, were firſt diſcovered about the year 1695, and ſoon after being found to be a powerful remedy in the cure of the dry belly-ache and ſome other prevailing diſeaſes of the climate, they were purchaſed by the country, with the adjacent lands, for the public uſe; an hoſpital was founded for the reception of poor people, and it was the object of the legiſlature, in order to make the place of the utmoſt poſſible benefit to the Iſland, to eſtabliſh a townſhip; accordingly commiſſioners were appointed, who were formed into a body corporate, veſted with authority for granting of lands and making the neceſſary laws and regulations reſpecting the town and the bath. The public deſign was much promoted by the zeal and liberal donations of ſome private gentlemen, particularly of *Peter Valette*, Eſq. (whoſe public and benevolent character is too well known in this Iſland to require any Eulogium) and the place began to be viſited, not merely on account of the ſalubrity of the waters, but as a faſhionable ſejour.

Nothing could have obſtructed the progreſs of this town, or hindered the completion of the public plan, but the unfortunate political factions that prevailed in the country during its infant ſtate; which deſtroying the harmony of private life, prevented the principal families from reſorting here as formerly, and the place has ſince that time fallen into conſiderable decline. The Houſe of Aſſembly has, nevertheleſs, not ſuffered the public to be deprived of the benefit of the waters by withholding any neceſſary grants for the keeping up of roads and buildings to make the place be conveniently viſited by invalids; and the liberal ſum they have lately given for theſe uſes, it is hoped, will, by rendering the baths more convenient, and the place more agreeable, cauſe a greater conflux of company to it. There are beſides many other circumſtances that concur in inviting people to the place, and in removing the objections that were formerly made againſt it; amongſt which I ſhall firſt mention the advantage of a better road, in conſequence of the late turnpike act; next to that of the change of of climate, which was formerly, in this neighbourhood, ſo exceedingly rainy as to be hardly habitable: the quantity of rain which has been known to fall in a given time, (to perſons not acquainted with the Weſt-Indies, and have not ſeen what are called the *ſeaſons,)* would ſeem incredible,—above 40 perpendicular inches have fallen in about the ſpace of 6 or 8 hours, which is nearly double the quantity that, on a medium, falls in Great-Britain through a whole year. The progreſs of cultivation having occaſioned the falling of the adjacent woods, has produced a great alteration in the ſtate of the ſeaſons, particular years excepted, as the laſt, which was a very wet one over almoſt the whole Iſland.

Laſtly, I muſt not omit to mention the Botanic Garden inſtituted here about five years ago, which is already in a flouriſhing ſtate, being ſtocked with a great variety of the moſt rare and uſeful plants collected from every quarter of the globe, and cannot therefore fail of furniſhing out a great deal of entertainment not only to the cultivators of natural ſcience, but to every one viſiting the place.

Analyſis of the Bath Waters.

THE waters (for there are ſeveral ſprings), iſſue from ſundry clefts and fiſſures in the rocks on the ſide of a ſmall river, called from thence the *Sulphur River*, whoſe ſource is in that ſtupendous pile of mountains which run eaſt and weſt through the Iſland: the ſeveral ſprings are ſituated very near to each other, no others of the ſame nature having been diſcovered in the neighbourhood; in the pariſh of Portland indeed, (on the oppoſite ſide of the great ridge) there is a ſmall one of the ſame kind, but of weaker impregnation, and lower temperature.

There appears to be no difference in the waters iſſuing from the ſeveral ſprings, except in their temperature, which is in ſome of them ten or twelve degrees leſs than in the principal one, which forms a current of nearly four inches diameter, and ſupplies the baths on the oppoſite ſide of the river.

The water when received into a glaſs at the fountain ſide is perfectly tranſparent, but has a fœtid ſulphureous ſmell and taſte, which it retains in ſome degree for ſeveral hours; this however ultimately flies off without any change or precipitation; and the water afterwards appears to be a very pure common water *.

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* This water is extremely well fitted for bottling, and proves not inferior to Briſtol water: The late Dr. *M^{c}Kenzie*, who reſided for ſome time at this place, had ſome of it by him in bottles for ſeveral years, which remained perfectly ſweet and good.

The immediate effects which follow on drinking the bath waters are, frequent eructations of wind, ſometimes a degree of Vertigo or head-ache, and ſickneſs at the ſtomach; a copious flow of perſpiration and urine; after which an exhilaration of mind generally enſues, with an encreaſe of appetite, and at night natural reſt.

GRAVITY.

THE ſpecific gravity of the water appears to vary a good deal from that of common water, as will be ſeen from the following experiments; when taken from the ſpring it is indeed lighter, on account of its heat and other cauſes, than common water, but cooled to the ſame point it becomes heavier, from the earthy and ſaline matter with which it is impregnated.

EXPERIMENTS.

1. AN *hydrometrical* gauge plunged into the Bath waters, taken as hot as poſſible from the ſpring, ſunk 4 inches 5-10ths.

2. The above mentioned inſtrument ſunk in common water heated to the ſame point, (*viz.* about 125 deg.) only 3 inches 6-10ths.

3. The ſame gauge ſunk in the Bath water, when cold, 1 inch 3-10ths.

4. The ſame gauge ſunk in the river water 1 inch 5-10ths.

The Bath water is therefore to common water, when hot, as 45 to 36, when cold, as 13 to 15.

By weighing it as accurately as I could with a common beam, I found the gravity of the Bath water to exceed that of the river 1 drahm and 20 grains in the pint.

It ſeems extraordinary that the Bath waters ſhould, when hot, be lighter than common water of the ſame temperature, and when cold, heavier; I can only explain it from the phlogiſton which it contains, many waters become heavier after a decompoſition takes place in their component principles: The Buxton waters, *e. gr.* placed in an exhauſted receiver, gave out no air bubbles, but turned whitiſh, and weighed 16 grains in the pint heavier immediately after, *(vid. Monro on Mineral Waters)*.

TEMPERATURE.

THE temperature of the ſeveral ſprings, ſo far as my obſervations have reached, is uniformly the ſame under all the differences of weather and variations of the atmoſphere; though, if we may credit the experiments made by gentlemen ſome years ago, the water appears to have been hotter than I have ever found it, and to have varied a few degrees in its temperature, at different times.

	FAHRENHEIT.
Heat of the main ſpring by my thermometer, - - -	127
Ditto of the low ſpring, - -	124
Ditto of the upper do. - -	114
Ditto of the higheſt do. - -	112
Ditto of the water running from the guttering into the baths, - -	122
Ditto of the water brought in a four gallon jug to the town, diſtant nearly two miles, - -	118

It might be expected, that I ſhould here explain the cauſes of heat in theſe ſprings, but the common hypotheſis concerning the generation of hot waters is very unſatisfactory, and I ſhall not preſume to offer any of my own: It may be ſufficient to obſerve, that the heat of ſome waters is entirely adventitious, not owing to any principles which they contain, but acquired by paſſing through ſtrata in the vicinity of volcanos or heated matters. Others appear to owe their heat either to ſome union or decompoſition in the foſſile matters through which the waters paſs, and by which they become impregnated; the nature of this union or decompoſition may be various, but has never been clearly underſtood, unleſs perhaps in the caſe of pyrites, on which the heat of the thermæ, or hot ſprings, is ſuppoſed moſt commonly to depend.

Experiments to aſcertain the Contents of the Bath Waters.

EXPERIMENT I.

THE Bath water, placed in the exhauſted receiver of the air pump, gave out very few air bubbles.

Having no air-pump I could not make this experiment myſelf; but it was tried ſome years ago by a medical gentleman[*], who anylyſed the Moffat Waters in this neighbourhood, and I believe with ſufficient accuracy.

EXPERIMENT II. A bottle filled with the Bath water immediately from the fountain, had an oiled bladder tied over the mouth of it, after which it was placed in a veſſel of hot water: The heat of the water being encreaſed to the boiling point, a ſmall quantity of air was ſeparated, which was ſecured by tying a ligature round the neck of the bladder, and afterwards made to paſs in a gentle ſtream through lime-water; but no precipitation enſued, as happened by breathing through the ſame lime-water (*vid.* p. 30.)

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[*] The account of this analyſis is *anonymous*, but I am informed it was wrote by Dr. *Mitchell*, formerly a practitioner in *Blue Mountain Valley*.

The Bath waters have been ſuppoſed to contain a conſiderable quantity of fixed air *, but from what circumſtance I cannot conceive, as they are totally deſtitute of that ſparkling appearance and poignant taſte that diſtinguiſh ſuch waters, and the above experiments plainly demonſtrate that they have no ſuch impregnation.

Experiment III. A bottle accurately filled with the Bath water was inverted in a veſſel full of the ſame water, ſo as to allow no air to enter the bottle; the veſſel with the water in this poſition was then placed over the fire, and the heat of the water encreaſed to the boiling point,—the water in the bottle was obſerved to deſcend about half an inch; but on ſuffering it to cool, it aſcended again, ſo as to leave no vacuum in the bottle.

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* *Vid.* Hiſtory of Jamaica.

EXPERIMENT IV. A bottle filled with the water was cloſely ſtopped by a cork, which was perforated by a crooked tube, the other end of which entered an inverted phial filled with water, and placed in a veſſel of water after the manner of Dr. *Prieſtly:* Being allowed thus to remain for 24 hours, there was no deſcent of the water in the phial.

The two laſt experiments ſerve to ſhew that the Bath waters contain no air of any kind, unleſs a ſmall quantity of common or atmoſpheric air, which I apprehend was what was extricated in experiment II. and III.—It is hence doubtful if the Bath waters contain any phlogiſticated or inflammable air as has been ſuppoſed.

EXPERIMENT V. Some of the fine blue flowers of a convolvulus were infuſed for an hour or two in the Bath water without ſuffering any change in their colour; on adding a ſingle drop of the oil of vitriol, the colour of the flowers was immediately changed from a blue to a bright red.

Experiment VI. Some drops of oil of tartar being added to a glaſs of the Bath water, no effervеſcence or other change enſued.

Experiment VII. Some drops of a ſolution of hepar ſulphuris being added to a glaſs of the Bath water, no lacteſcence was produced, till I dropped in a little oil of vitriol.

Experiment VIII. Some drops of an unſaturated ſolution of lead in the nitrous acid, were added to a glaſs of Bath water *, which effected no alteration.

Experiment IX. Some drops of a ſolution of mercury in the nitrous acid were added to a glaſs of the Bath water, no yellow precipitation enſued †.

From theſe experiments (N° 5, 6, 7, 8, 9,) it is very apparent that the Bath waters contain no vitriolic acid (*vid.* page 31) in a ſeparate ſtate.

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* See this experiment explained, page 34.

† Ditto do. do. page 37.

Experiment X. Some drops of the oil of vitriol were added to a glaſs of the Bath water, no ebullition or efferveſcence enſued.

In the account given of the Bath waters in the hiſtory of Jamaica, it is ſaid, that acids dropped into the Bath water cauſe an ebullition; but it is certainly a miſtake, and I believe it has ariſen from the obſerver not rightly diſtinguiſhing between an ebullition and the difficult mixture of the acid and the water; the acid, being ſo very ponderous, on being dropped into the water falls through it, and cauſes an appearance that might be miſtaken for an efferveſcence, by perſons not properly acquainted with the ſubject.

Experiment XI. A ſolution of ſal martis being dropped into the Bath water, no ochrous precipitation followed, (*vid.* p. 35, ſec. 4.)

Experiment XII. Some drops of a nicely ſaturated ſolution of chalk in the nitrous acid were added to a glaſs of Bath water, but no precipitation enſued, (*vid.* p. 35, ſec. 3.)

Theſe experiments, (N° 10, 11, 12,) clearly ſhew that there is no alkali in the Bath water, (*vid.* p. 35.) but leſt the alkali might be in too diffuſed a ſtate to be diſcovered by the above teſts, I repeated the experiments on the water after conſiderable evaporation, and the reſult was the ſame.

Experiment XIII. To the Bath waters I added a ſmall portion of alkaline ſalt, and obſerved no change, but the ſame experiment being tried, after evaporating the water a little, a white precipitation followed, (*vid.* p. 14.)

Experiment XIV. A few drops of a ſaturated ſolution of lead in the nitrous acid, added to the Bath water, cauſed a milkineſs, (*vid.* p. 14.)

The ſame effect followed on adding a clear ſolution of ſaccharum ſaturni.

Experiment 15. The water during evaporation, with a very gentle heat, depoſited a quantity of reddiſh brown earth, which I ſeparated by decanting the liquor from time to time as it collected at the bottom of the veſſel.

Experiment XVI. To the earthy precipitate obtained in the preceding experiment, I added ſome diſtilled water, but only a part of it diſſolved.

Experiment XVII. To the foregoing precipitate repeatedly waſhed in freſh quantities of diſtilled water, I added ſome drops of the oil of vitriol, which cauſed a ſlight effervefcence; but great part of it remained undiſſolved, which was alſo inſoluble in the nitrous acid, and with difficulty ſoluble in water.

Experiment XVIII. After further evaporation of the water I placed it at reſt for 12 hours, and then found it covered with thin laminous chryſtals like the ſcales of fiſhes, which being taken off and put in diſtilled water, great part of them continued to float therein, remaining undiſſolved for ſome days: the taſte of theſe chryſtals was rough and earthy, not ſaline. Theſe are the properties of the ſelenitic compound (*vid.* p. 8); which the following experiment more clearly demonſtrate them to have been.

Experiment XIX. To a ſolution of the chryſtals (exp. 18) in diſtilled water, I added ſome drops of the ſolution of mercury in the nitrous acid, which cauſed a yellow precipitation (*vid.* p. 37, ſec. 5.)

Experiment XX. That portion of the earth which was diſſolved by the vitriolic acid in experiment 15, was precipitated again by adding a few drops of oil of tartar. I waſhed the precipitate in diſtilled water, and then re-diſſolved it in freſh vitriolic acid; the liquor formed thereby was bitter and ſaline, reſembling that of epſom ſalts.

I repeated this ſolution and precipitation ſeveral times, ſo as to leave no doubt of the earth being a *magneſia*.

The foregoing experiments made on the earth precipitated during evaporation, were all repeated on the reſiduum left after evaporation to dryneſs, with nearly the ſame reſult, only that I found it difficult to obtain the earth entirely pure, ſome of the ſaline matter adhering, notwithſtanding repeated affuſions of diſtilled water.

Magneſia in waters is generally combined with the vitriolic acid, conſtituting epſom ſalts; but as there are no ſigns of vitriolic acid in this water, unleſs in the ſelenitic compound, it is not improbable that the magneſia is blended with the ſea ſalt, which this water appears, from the ſubſequent experiments, to contain, forming with the muriatic acid a fixed ammoniac (*vid*. p. 8. ſec. 3.)

Experiment XXI. On dropping a ſolution of ſilver in the nitrous acid into the Bath water, a white curdled precipitation immediately took place, (*vid*. p. 38. ſec. 4.)

Experiment XXII. The precipitate in the preceding experiment, with a little tartar, being rubbed on poliſhed braſs, gave it, by the aſſiſtance of heat, a ſilver colour *.

Having theſe evident proofs, (experiment 20, 19,) of the preſence of muriatic ſalt, I endeavoured to obtain it in its chryſtallized ſtate.

Experiment XXIII. A quantity of the reſiduum was diſſolved in diſtilled water, and the liquor decanted clear from the earthy ſediment, which was then ſlowly evaporated, firſt by the fire, and then by the ſun. Regular cubical chryſtals were thus obtained, having all the properties of common ſalt, (*vid*. p. 37.)

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* This precipitate called a *Luna Cornea* is the ſubſtance made uſe of by artiſts for ſome kinds of ſilvering.

Experiment XXIII. A portion of the reſiduum (experiment 15,) being thrown on a hot iron, gave out no fumes or ſmell of ſulphur.

Experiment XXIV. The incruſtation adhering to the rocks about the ſpring was alſo burnt, but yielded no proofs of its containing any ſulphur.

Experiment XXV. A new coined bright dollar was placed in the water at the place of its iſſue, which in a few minutes was tarniſhed of a deep purple colour,—a bright piece of gold coin was turned of a deep copper colour. The ſame trials being made at the extremity of the gutturing, where the water is diſcharged into the Baths, the metals were but ſlightly tarniſhed after lying a conſiderable time.

Experiment XXVI. Having made certain characters on paper with the ſympathetic ink, (*i. e.* a ſolution of ſaccharum ſaturni in water) I tied the paper over a broad mouthed bottle filled with the Bath water, the vapours of which ſoon rendered the characters viſible.

Experiment XXVII. Saccharum ſaturni diſſolved in the Bath water cauſes no red or brown precipitation.

Theſe experiments (N° 23 and 24) prove that the Bath waters contain no actual ſulphur (*vid.* p. 39); but the following ones (N° 25 and 26) evidently ſhew the preſence of the phlogiſton in ſome form (*vid.* p. 40): Why experiment 27 does not ſucceed I cannot tell, unleſs from the phlogiſtic principle being ſo very volatile as not to remain long enough to produce the effect.

The fætor of theſe waters indicate the preſence of a hepar ſulphuris (*vid.* p. 40); but this is rendered doubtful by the experiments made with acids (*vid.* experiment 10) which cauſe no precipitation, and others ſhewing that the waters contain no alkali.

From what has been ſaid (*vid.* p. 41) concerning hepar ſulphuris with quick-lime, it is obvious that ſulphur cannot be ſuſpected in the Bath waters, in this form.

In what ſtate of combination then, are we to ſuppoſe the phlogiſton exiſtent in theſe waters? According to the late diſcoveries, reſpecting the various ſpecies of phlogiſticated air, it ſeemed exceedingly probable that it was in ſome ſuch form: This opinion ſeems, however, overturned by experiment 2d and 3d, in which I found it impoſſible to obtain any air that was permanent.

The mode of combination muſt ſtill remain a deſideratum, as chemiſtry has not, that I know of, found out any other methods of trial for aſcertaining it.

Before I diſmiſs this ſubject I muſt not omit taking notice of Dr. *Brown*'s hypotheſis concerning theſe waters, (*vid. the Natural Hiſtory of Jamaica*) which is, that they contain the volatile vitriolic acid connected with a calcareous earth: they certainly contain *ſelenites*, but this affords no explanation reſpecting the phlogiſton. Beſides, how the volatile acid can be ſuppoſed combined with the calcareous earth, I do not conceive; for ſelenites is one of the moſt fixed ſalts we know of. As he has taken no notice of any of the other contents of theſe waters, which were very obvious on the ſlighteſt trial, I ſuſpect that he never made any experiment on them, but ſpoke merely from conjecture.

Experiment XXVIII. Into a glaſs of the Bath water I dropped a ſmall quantity of the tincture of galls in brandy; no apparent change took place after ſtanding ſome time, till I added a ſolution of iron, when it immediately aſſumed a deep purple colour.

Experiment XXIX. I repeated the foregoing experiment, uſing, inſtead of the galls, the phlogiſticated alkali; but no effect followed till I added the iron, when the uſual beautiful blue precipitation immediately took place (*vid.* p. 45.)

It is hence (*viz.* from N°. 28 and 29) obvious, that theſe waters have no metallic impregnation, though they have been generally ſuppoſed to contain ſome iron; and Mr. *L——* (*vid. Hiſt. Jamaica*) ſays, that there is an ochrey precipitation about the rocks over which the waters run. The yellow ſlimy incruſtation about the rocks may have ſomething of the appearance of an ochre, but from the following experiment it does not ſeem to contain any iron.

EXPERIMENT XXX. I took a quantity of the above mentioned ſlimy matter, adhering about the rocks where the ſpring is, which having firſt dried in the ſun, I mixed with oil and charcoal duſt, and placed it in the ſtrong heat of a furnace for ſome hours; a blackiſh gritty powder was found in the crucible, which was not in the leaſt affected by the magnet.

EXPERIMENT XXXI. I then ſubjected it to the fire without any admixture, ſuſpecting that it was of a vegetable origin, and would yield a pot-aſh; after keeping it for a conſiderable time in a very violent heat, I obtained a powder reſembling brick duſt, reddiſh and gritty; a part of this powder effervеſced with acids and diſſolved, but moſt of it retained its gritty form. Pot-aſh being at firſt in a cauſtic ſtate, this experiment muſt not be tried immediately after removing it from the furnace, unleſs you throw in fixed air to the water you mix it with.

I infer from the foregoing experiment, (N° 31) that the ſlimy matter of the rock is partly of a vegetable nature, produced by the putrefaction of leaves, &c. falling into the water, and partly ſtoney, ſome particles of ſand and rock being entangled in it.

Experiment XXXII. *On the Rock.*—The rock being kept for ſome time in a ſtrong heat, was partly converted into quick-lime.

Experiment XXXIII. The rock powdered and mixed with charcoal, &c. as in experiment 30,—ſhewed no ſigns of iron; ſome of the iron ore in the neighbourhood being tried in the ſame manner, was afterwards attracted very ſtrongly by the magnet.

Having thus related and explained my ſeveral experiments made on the Bath waters, I ſhall next, after ſumming up the reſults in a general table, proceed to ſhew their effects on the human body, and their cure in diſeaſes.

Table of Experiments and Reſults.

EXPERIMENTS.		RESULTS.
Nº 1, 2, 3, -	Shew that the BATH WATERS contain.	*No fixed air.*
— 1, 2, 3, 4, -		*No inflammable air.*
— 5, 6, 7, 8, 9,		*No ſeparate acid.*
— 10, 11, 12, -		*No ſeparate alkali.*
— 13, 14, 15, 16, 17, 18, -		*A ſelenetic ſalt.*
— 20, - - -		*Earth of magneſia.*
— 21, 22, - -		*Common marine ſalt.*
— 23, 24, - -		*No actual ſulphur.*
— 25, 26, - -		*A good deal of phlogiſton*
— 10, 11, 12, -		*No hepar ſulphuris.*

CHAPTER IV.

On the Effects and Uſes of the Bath Waters.

HAVING learned by analyſis the matters contained in mineral waters, we can ſometimes with certainty determine, *a priori*, what will be their effect on the human body; but not univerſally; for notwithſtanding the ſeveral principles of a water may be clearly detected, yet their mode of combination being unknown, their uſes can only be conjectured, till experience has aſcertained them. The Somerſetſhire Bath Waters, *e. g.* contain, according to the lateſt and beſt analyſis by Dr. *Faulkener* and others, *a little common ſalt, ſome hepar ſulphuris with quick-lime, a minute portion of iron,* (viz. *only one 37th of a grain in a pint of the water) ſome ſelenites and fixed air.* However active theſe principles may be, I apprehend it will be impoſſible, from the ſmall proportion they contain of each, to account fully for their extenſive influence in the cure of diſeaſes. There will be as much difficulty in accounting ſatisfactorily for the operation of our waters; yet from comparing their effects together, their general action ſeems to be *ſtimulant*; which power they owe chiefly to the ſulphureous gas, or phlogiſtic principle, the fixed contents being in too ſmall a quantity to be productive of any material operation.

That the Bath waters act as a ſtimulant is very obvious from the immediate effects which the drinking of them produce, *viz.* eructations of wind, vertigo, head-ache, and fever, *&c. &c.* (*viz.* p. 53) as well as from the nature of ſeveral diſeaſes in which they are found remedial.

Dr. *Brown*, in his Natural Hiſtory of the Iſland, ſays of theſe waters, "that they are "remarkably beneficial in all capillary ob-"ſtructions or diſorders proceeding from "weakneſs or the want of proper glandular "ſecretions; in all lentors or viſcidities pro-"ceeding from the inaction of the ſolid ſyſ-"tem; in conſumptions, nervous ſpaſms "and weakneſſes: They reſtore the appetite "and uſual action of the viſcera, invigorate

"the circulation, warm the juices, open the
"ſkin and urinary paſſages, ſtrengthen the
"nerves, and ſeldom fail of produceing eaſy
"ſleep at night.

Mr. L * * * *, in his well wrote Hiſtory of the Iſland, gives nearly the ſame account of theſe waters ;—He ſays, "they
"excite appetite, promote urine, produce
"ſleep, cure ulcers, ſtrengthen the nerves,
"and cure palſey.

Theſe effects, moſt of which I have ſeen verified in a great number of caſes, evidently indicate a ſtimulant power. 1ſtly, The expulſion of flatulencies, increaſe of appetite, &c. ſhew that the water excites the action of the ſtomach. 2dly, The vertigo, head-ache, and fever, which they ſometimes induce, are conſequent on an encreaſed circulation. 3dly, Their diuretic effects, in like manner, proceed from their ſtimulant action on the kidneys : their operation in this reſpect, is in part owing to the quantity taken in as a diluent, but they have certainly a further effect than as a mere diluent ; for in ſome caſes * the quantity of urine diſcharged has greatly exceeded the whole quantity of fluid made uſe of. 4thly, An increaſe of perſpiration may be variouſly accounted for; 1ſtly, the waters may prove diaphoretic from their action in the ſtomach, between which and the extreme veſſels of the body there is a particular conſent: 2dly, They muſt be diaphoretic as being diluent; but beſides, they may, 3dly, from their ſulphureous contents, act as a ſtimulant in the extreme capillary veſſels.

Whether the Bath waters may not alſo have ſome *alterant* and *antiſpaſmodic* power, I ſhall not determine, but it would ſeem probable that they are poſſeſſed of both.

Having ſaid thus much to explain the general nature and action of the Bath Waters, I ſhall now conſider their uſes in particular diſeaſes.

I. The *Dry Belly-ache* ſeems to have been the complaint in which the good effects of the Bath waters were firſt moſt eminently experienced, and they have ever ſince been applied to as a moſt ſovereign remedy againſt the paralytic torpor and relaxation that ſupervene to the excruciating ſpaſms which by turns affect the bowels and limbs of people in this horrid diſeaſe. I muſt not in this place enter largely into the conſideration of either the cauſes or cure of this complaint; but whatever it depends on, whether on the action of any poiſon taken in (as of lead, acid, ardent ſpirit, &c.) on an acrimonious bile in the firſt paſſages, or on a conſtriction of the ſurface from cold, concurring with an irritable ſtate of the bowels, it is obvious, that, after removing the conſtipation, the principal indication of cure is to reſtore the loſt tone. As *ſpaſm*, or a violent ſtate of contraction in the muſcular fibres, produces the alternate ſtate of *atonia* or relaxation, ſo *vice verſa*, atonia gives occaſion to the return of ſpaſm: Accordingly we ſee that patients, once affected with this diſorder, are ſubject to frequent relapſes, which nothing can ſo effectually prevent, as exciting the action of the inteſtinal canal. With this view various medicines are employed, but the

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* I am obliged to my friend Dr. *Clarke* for a very particular caſe of this nature.

Bath waters have been found, of all others, the moſt uſeful remedy: Their effects in ſuch caſes ſeem almoſt miraculous.

The uſe of the Hot Baths jointly with the waters, 1ſt, by the grateful ſtimulus they impart to the nervous ſyſtem, and, 2d, by cauſing a free determination to the ſurface, contribute greatly inremoving the torpor and palſey of the extremities.

II. *Genuine Palſey*, or *Hæmiplegia*, is a a diſorder totally of a different nature from the preceding. There is in this caſe an affection of the brain, or of the nerves in their origin; but notwithſtanding ſuch a diſſimilitude, the Bath waters may, in conjunction with other remedies, prove extremely beneficial. A remarkable inſtance has lately occurred of the efficacy of the Bath waters in paralytic diſorders,—A gentleman under recovery from a long fever, by expoſure to cold air, ſuddenly loſt the uſe of all his limbs; Having tried the uſe of ſeveral remedies with little effect, he had recourſe to the Bath waters, by which he was in a few weeks perfectly recovered.

III. The uſe of the Bath waters is highly conducive to *convaleſcents* of every claſs, eſpecially after fevers: By exciting appetite and invigorating the bowels, it reſtores the tone of the whole ſyſtem, and obviates a tendency to relapſe.

IV. The effects which the Bath waters have on the nervous ſyſtem, and in aſſiſting the functions of the ſtomach, ſhew them to be a very fit remedy in all *hyſterical* and *ſexual* complaints.

V. I ſhall next conſider how far the Bath waters are uſeful in *viſceral obſtructions*, or in complaints of the liver and ſpleen; patients labouring under theſe complaints have frequently had recourſe to theſe waters, and, I believe, have not always been diſappointed of receiving benefit, but I nevertheleſs think that in ſuch complaints they are rather an ambiguous remedy: So far as they ſtrengthen the functions of the ſtomach and the bowels they may be uſeful, but from their ſtimulant or heating quality, they may ſemetimes do hurt by exciting inflammation. Perſons who have undergone a mercurial regimen for the removal of theſe complaints, may, however, derive great advantage from the waters: The danger of topical inflammation being removed, the uſe of them will afterwards contribute much to their recovery. This leads me to ſpeak of their effects after ſalivation in other diſorders.

VI. Mercury, though the only certain remedy which ſome diſeaſes admit of, is nevertheleſs an hazardous one; under the moſt careful management it ſometimes makes great depredations in the conſtitution, particularly in warm climates, where the tone of the ſyſtem being once impaired, is difficultly recovered. In this view, and for removing ſome ſymptoms, which mercury of itſelf is not a cure for, the Bath waters are highly beneficial in the lues venerea: They ſerve to ſupport the general health, and perhaps aſſiſt in waſhing out the venereal virus. With the Hot Baths they are of great uſe in relieving the nocturnal pains, cleaning and curing the ulcers, eruptions, *&c. &c.*

They have in ſome inſtances diſcovered a ſingular efficacy in ſtopping old *gleets* *. They may operate in two ways in the cure of ſuch complaints; 1ſt, as a diluent in waſhing out ſome latent virus; or, 2dly, by their tonic power in the ſtomach, and in bracing up the whole ſyſtem. It is, however, immaterial how they act, if they produce the effect, which is unqueſtionable: I have no doubt of their proving equally ſo in the *fluor albus*.

VII. The Bath waters are not only ſerviceable in the lues venerea, but alſo in that more loathſome diſtemper of negroes, the *yaws*: By the drinking of the waters, and the uſe of the hot baths, the eruption is thrown out more plentifully on the ſurface of the body, and the matter eliminated; by which the internal ſyſtem ſeems to be relieved, and the cure expedited. Nothing can be more pernicious than the general practice of negroes in this diſorder, I mean that of waſhing in the cold rivers. The ſurface being by that means conſtringed, the yaws are repelled, which I believe is frequently the cauſe of ſubſequent bone-ache and diſtortion.

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* Dr. *Irvine*, a gentleman univerſally known for his many virtues, as well as by his long reſidence in this neighbourhood, has favoured me with a very ſingular caſe of this kind, where a perſon was cured by the Bath waters of a gleet of eleven years ſtanding.—I know of ſome other caſes almoſt as ſingular.

VIII. Every kind of cutaneous diſtemper may receive advantage from the Bath waters. An inveterate *leproſy* was relieved by it; but I apprehend that in cutaneous defœdations there may be found waters ſtill more uſeful than thoſe of the Bath. Their uſe in abſterging and drying up foul ulcers, is ſo well known I ſhall ſay nothing on the ſubject.

IX. Dr. *Brown* mentions *conſumption* among the diſeaſes in which the Bath waters are uſeful; but if he means a conſumption of the lungs, I ſhould fear he is miſtaken: Conſidering the degree of phlogiſtic diatheſis, or inflammatory diſpoſition that prevails in this diſeaſe, I conceive the Bath waters may rather tend to aggravate than relieve the ſymptoms; but I have no experience, and have not been able to collect any facts on the ſubject.

X. I ſhould not either ſuppoſe the Bath waters indicated in *dropſy*, but a cure in that diſorder has been obtained by ſuch various and even oppoſite means, that I ſhould not think the trial of them improper where other remedies have failed. The Bath waters being poſſeſſed of an active principle, capable of producing material changes in the ſyſtem, may accidentally excite the action of the abſorbent veſſels, and cauſe the waters to be carried off by the different outlets of the body.

XI. In the *jaundice* they are uſeful after the obſtruction in the biliary ducts is removed, for carrying off the bile in the circulation, and for ſtrengthening the impaired functions of digeſtion, *&c.*

XII. The diuretic effect of the Bath waters make them uſeful in *nephritic* complaints, in which they operate both as a diluent and by a ſpecific quality without much ſtimulus. In ſuch *nephritic* affections as depend on a gouty diatheſis, the Bath waters are calculated to anſwer extremely well, which will be obvious from what I have to remark on their effects in the gout.

XIII. The gout is a diſeaſe depending not on a *morbid matter*, as has been commonly ſuppoſed by phyſicians as well as others, but on a certain ſtate of the moving fibres, which belongs to a particular temperament or conſtitution that is frequently hereditary, being tranſmitted from father to ſon in the ſame way as a likeneſs of features and other conſtitutional peculiarities: Hence there is no cure to be obtained in the gout but by obviating the effects of this particular temperament, which is only done in one way, *viz.* by exerciſe and abſtinence from animal food. The diſeaſe, as an *articular affection*, ſeems ſalutary, tending to preſerve the conſtitution; but when it becomes irregular and miſplaced, it is then dangerous and deſtructive. Every caſe of irregular and miſplaced gout probably depends on the want of a neceſſary degree of tone in the ſtomach, to determine the affection to the extremities. We from hence ſee how the Bath waters are ſerviceable in the gout. The waters and hot baths, by exciting the action of the ſtomach, and of the extreme veſſels, call back the gout to the joints, after being repelled, or determine it there, when wandering about the body.

When the conſtitution is much debilitated, and the gout occaſions affections of the head and ſtomach particularly, inſtead of producing inflammation in the joints, it is called *atonic*; that is, from the want of *tone* the diſeaſe which ſhould be ſeated in the extremities ſeizes on other parts, or is not able to form in the joints. In caſes of this nature the Bath waters are very beneficial.

The inhabitants of the Weſt-Indies make frequent voyages to Great-Britain on account of health when perhaps they have a remedy nearer at hand. In the atonic gout Dr. *Cullen* recommends a warm climate, and I therefore embrace the opportunity of ſuggeſting to Jamaica gentlemen reſiding in Great-Britain, that under this diſeaſe they have in their own Iſland a climate more propitious, and in the Bath waters a remedy not leſs efficacious, and which deſerved to be no leſs celebrated than thoſe of England.

I might go on to illuſtrate the effects of the Bath waters in a variety of other diſeaſes, but I ſhall take notice of only one more, *viz.*

XV. *Chronical rheumatiſm*, which ſignifies, habitual pains affecting particularly the large joints of the body without much fever, and ſometimes with little ſwelling, but with debility and coldneſs of the affected part. Rheumatic affections are the complaints of people in cold climates; but the inhabitants of the Weſt-Indies are not exempt from them. Expoſition to rain, night dews, and the north winds that blow at a particular ſeaſon of the year, occaſion ſuch diſorders, that are apt, notwithſtanding every care and attention to medicine, to return and become chronical. The Bath waters ſtand very much recommended in ſuch caſes, though at firſt they ſeem to aggravate the diſeaſe, the pains being for ſome time exaſperated: By perſeverance, however, the patient is ſure of obtaining relief.

Having, as I preſume, ſaid enough to ſhew the general utility of theſe Bath waters, and to direct to the uſe and application of them; nothing remains but to make a few remarks on the method of uſing them.

Rules for the drinking of mineral waters can only be general; they are nevertheleſs of uſe. The following ones are ſuch as I think more particularly require attention.

I. To begin the uſe of the waters with ſmall draughts, which may be repeated at ſhort intervals, as the ſudden ingurgitation of a large quantity may ſometimes cauſe uneaſineſs and bad effects, (*vid.* p. 53.)

II. To uſe now and then a gentle laxative as occaſion may require, to prevent a conſtipated ſtate of the bowels.

III. To drink them as nearly to the fountain or place where they iſſue, on account of the extreme volatility of their medicinal principle, which is ſo remarkable that it is comparatively of little uſe to drink them at any diſtance; they loſe even in their tranſportation acroſs the river *, (*vid.* p. 66, ſec. 4.)

IV. To continue the uſe of them for a due length of time.

The character of any medicine being eſtabliſhed, people are commonly diſpoſed to expect too much from it. There are inſtances where the effects of the Bath waters have been manifeſted very ſuddenly, but in ſome chronical caſes it is requiſite they ſhould be perſiſted in for ſome length of time: Patients, after having deſpaired of obtaining any relief, have, by perſeverance, obtained a perfect recovery from the moſt inveterate diſeaſes.

V. To uſe the hot baths in the afternoon rather than in the morning, as they tend to procure eaſe and ſleep: Care ſhould be nevertheleſs taken to avoid cold on returning from the Baths, and they ought not to be uſed too ſoon after meals.

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* The inconvenience which at preſent attends getting to the ſpring will be ſoon removed by a bridge that is to be built acroſs the river.

VI. Laſtly, as to regimen.—I know of no particular one required by the Bath waters. It has been cuſtomary to avoid wine and fruits, not as I apprehend, from any diſagreement theſe have with the waters, but becauſe they have not been ſuited to the complaints for which the waters were drunk: A little wine may be ſometimes very neceſſary, but in general it is better totally to relinquiſh it, as the preciſe limits are difficult to be aſcertained, and as it may interfere with the uſe of the waters.

That I may omit nothing that can be of uſe in directing to the application of theſe waters, I ſhall here ſubjoin a catalogue of all ſuch diſeaſes as they are likely to prove beneficial in.

"*Quot et quam diverſi morbi curentur,*
"*thermarum et aquarum medicatarum uſu!*
"*Ad has confugere toties coguntur ægri, de-*
"*cantiſſima alia remedia experti abſque ullo*
"*fructu,* &c. *In* Thermis, *aqua nativo ca-*
"*lore laxat omnia & emollit, venis bibulis*
"*cutaneis ſe inſinuat, ſanguini permiſcetur,*

“ *obſtructa loca alluit ; et ſi potentur ſimul, ſalubres illæ aquæ, tutum et potens habetur remedium,* &c. &c.” Vid. V. Swieten Comm. Tom. III. page 345.

CATALOGUE of DISEASES

in which the Bath Waters *are uſeful.*

ABORTION, *(viz. after)*
Anorexia, or want of appetite.
Aſthma,
  1. *Nervous*, 2. *Gouty*.
Cancer.
Chorea, Sp. Vit. and
Cholera morbus, *(viz. after)*
Convulſions in general
Colic, *viz.*
  1. *Belly-ache*, 2. *Hyſterical*, 3. *Gouty*.
Conſumption, *(doubtful.)*
Crapula, or after ſurfeits.
Deafneſs.
Dyſury, or pain and difficulty in paſſing urine.
Elephantiaſis.
Epilepſy.
Fevers, *(viz.* when recovering from, and to obviate a return of, particularly, nervous fevers.)
Flatulencies.
Fluor albus.
Gleets.

Green ſickneſs.
Gutta ſerena.
Gout, *viz.* the atonic and irregular.
Herpes, impetigo, *&c.*
Hypochondria, and
Hyſterics.
Jaundice.
Iſchias, or hip-gout
Iſchury, ſtoppage of urine.
Lethargy. Leproſy.
Lues venerea, *vid.* p.
Lumbago, or rheumatiſm in the loins.
Menſes (ad movendas)
Nephritis,
 1. *From Stone,*
 2. *From Gout.*
Palpitations.
Palſey, *vid.* p. .
Poiſons, (for recovery after)
Rheumatiſm, *vid.* p. .
Ricketts.
Salivation, (after)
Sterility.
Stone in the kidneys or bladder.
Strangury.
Stupor.
Suppreſſion of urine.
Tendons contracted.
Tetanus, locked jaw.
Torpor.
Vertigo.
Ulcers, mali moris.

CATALOGUE of PATIENTS

who were either cured or greatly relieved by the drinking of the Bath Waters.

[Taken from a Memorandum-Book of *P. Valette*, Eſq. kept by him for that purpoſe before any Surgeon or Phyſician was appointed to the ſaid Bath.]

MR. B. Harris, cured of ———

Mr. G. Galbraith, of rheumatic pains.

Mr. M'Queen, of a lingering ſever.

Mr. Roſs, of ditto.

Mr. James Watſon, of a dry belly-ache.—*N. B.* He was eaſed by the firſt draught of the water.

Mr. Alexander Grant, of the gravel.

John Gale, Eſquire, of a lingering fever and loſs of appetite.

* William Hicks, Eſq. of a ſwelling in the ſpleen.

John Goſling, of an intermittent.

John Robertſon, of ditto.

Charles Anſell, of a dry belly-ache.

Charles Webb, of a lingering fever.

Charles M'Farquhar, of a dry belly-ache.

Mr. Renny, of a lingering fever.

Miſs Barry, of a belly-ache with palſey of the limbs.

Miſs Gardiner, of a dry belly-ache and great weakneſs in the limbs.

Mrs. Puſey, of a lingering fever and pain in the ſtomach.

Mr. Joſeph Morris, of a dry belly-ache.

Mrs. Kilby, of loſs of appetite.

T. B. Ruſſell, of a dry belly-ache.

Mr. Clarke, of the gravel.

John Puſey, Eſq. of a lingering fever.

Mr. T. Fox, of the dry belly-ache and gravel.

Thomas Allan, of the dry belly-ache and conſumption.

* Mr. Cargil, of the ſciatica in four weeks.

Peter Carr, of ditto.

Mrs. Nelſon, of ditto.

Mrs. Forbes, of the hyſterics, and loſs of appetite and ſleep.

* Capt. Joſ. Lawrence, in one week greatly relieved of a ſwelling of the ſpleen and venereal ſtrangury.

Mr. Maitland, of the rheumatiſm.

Capt. J. Lawrence, of the gleet, ſtrangury, *&c.*

Mrs. Garrioch, of a ſwelling of the ſpleen— Twice diſſipated, and intermittent fever.

Mrs. M'Farquhar, of a belly-ache and weakneſs of the limbs.

* Mr. Alex. M'Farlane, of the ſciatica.

Colonel Price, of a lingering fever, loſs of appetite and ſleep,

Mr. S. Woolery, of a complication of diſtempers.

Mr. Lawrence Brodbelt, of the gravel, when given over by the faculty and his friends.

Mr. Golding, (of Withywood) of the gravel.

Captain Simon Booth, of a ſwimming in his head, loſs of appetite, *&c.*—Was eight different times relieved of the above complaints.

* Daniel Hanmer, Eſq. of a violent rheumatic complaint in 23 days time.

Thomas Robertſon, of an intermittent fever of 14 months ſtanding, by 3 weeks uſe of the water.

Mr. Drower, of a fever and belly-ache in one week.

James Craddock, of the gravel when reduced extremely low. *N. B.* A great deal of gravel diſcharged.

Chriſtopher Terry, of the gravel, perfectly recovered in 5 weeks.

William Gordon, (Clarendon) of lowneſs of ſpirits and depraved appetite.

Mr. Yanckey, (Guanaboa) of ditto.

* Alex. Low, Bricklayer, of the gravel and violent pain in 4 days.

N. B. Thoſe marked with an aſteriſm *, did not ſtay long enough to obtain a perfect cure, but were greatly relieved.

CATALOGUE of PLANTS

the moſt remarkable for Uſe or Beauty, which are in the Botanical Garden at Bath.

LAurus,	*Cinnamomum,*	The Cinnamon tree
——,	*Saſſafras,*	Saſſafras tree
———,	*Camphora,*	Camphor tree
Garcinia,	*Mangoſteena,*	Mangoſteen
Mangifera,	*Indica,*	Mangoe tree
Cycas,	*Circinnalis,*	Sagoe palm
Mimoſa,	*Nilotica,*	Gum Arabic tree
Myrica,	*Cerifera,*	Candleberry myrtle
Croton,	*Sebiferum,*	E. Ind. Tallow tree
Amygdalus,	*Perſica,*	Peach tree
———,	*Communis,*	Almond tree
Juniperus,	*Bermudienſis,*	B. Juniper or cedar
Thuya	*Orientalis,*	Chineſe Arbor vitæ
Fraxinus,	*Ornus,*	Manna Aſh
Cupreſſus,	*Sempervirens,*	Upright Cypreſs
Gardenia,	*Florida,*	Cape Jeſſamine
Magnolia,	*Grandiflora,*	Laurel leaf tulip tree
Syringa,	*Lilac,*	Scotch Lilac tree
Smilax,	*Sarſaparilla,*	Sarſaparilla
Epidendrum	*Vanilla,*	Vanilla
Hedyſarum,	*Movens,*	Moving plant
Hibiſcus,	*Roſa Sinenſis,*	Chineſe roſe.

N. B. There are a great many others no leſs uſeful or beautiful, but being more common it was not thought neceſſary to enumerate them.

There are alſo ſeveral curious and unknown Eaſt-India plants, preſented by (the never to be forgotten friend of this Iſland) *Lord Rodney*, amongſt which is a moſt elegant palm, ſuppoſed to be the walking cane.

BRITISH 26 JY 77 MUSEUM

FINIS.